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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ANDREW J. HAZELTON and HIROAKI TAKAIWA

Appeal 2015-001841[1]
Application 13/941,849
Technology Center 2800

Before JEAN R. HOMERE, GARTH D. BAER, AND SHARON FENICK, *Administrative Patent Judges*.

BAER, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] Appellants identify Nikon Corporation as the real party in interest. App. Br. 1.

STATEMENT OF THE CASE

This is a decision on appeal, under 35 U.S.C. § 134(a), from the Examiner's Final Rejection of claims 1–53. App. Br. 8. Oral argument was heard jointly for the present appeal and related Appeal No. 2015-001774 (Application No. 13/938,491) on January 19, 2017. A transcript of the hearing will be placed in the record in due course. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

BACKGROUND

A. The Invention

Appellants' invention relates to "a liquid immersion lithography apparatus and method [that] exposes a substrate with light via a projection system and liquid." Abstract.

Claim 1 is representative and is reproduced below.

> 1. A liquid immersion lithography apparatus which exposes a substrate with light via a projection optical system and a liquid, the apparatus comprising:
>
> a table assembly that has a top surface and is movable relative to the projection optical system while supporting the substrate at a top surface side of the table assembly, each of the top surface and the supported substrate being positionable opposite to the projection optical system such that an immersion area, which is locally formed with the liquid under the projection optical system, is maintained between the projection optical system and a portion of one of the top surface and a surface of the supported substrate or both; and
>
> a sensor that has a top surface; wherein

> the table assembly has a first opening portion at the top surface of the table assembly and is movable relative to the immersion area while maintaining the immersion area under the projection optical system,
>
> the top surface of the sensor is arranged inside of the first opening portion and is positionable opposite to the projection optical system by the table assembly such that a gap, in which the liquid is capable of being maintained, is formed between the projection optical system and the top surface of the sensor, and
>
> the top surface of the table assembly and the top surface of the sensor are apposed on a substantially same plane, or are substantially co-planar.

App. Br. A-1.

B. The Rejection on Appeal

The Examiner rejects claims 1–53 under 35 U.S.C. § 103(a) as obvious over Fukami (WO 99/49504; Mar. 16, 1999) in view of Miyajima (US 6,801,301 B2; Oct. 5, 2004). Final Act. 2.

C. Appellants' Contentions

1. Appellants contend that the Examiner erred in rejecting claims 1–53 under 35 U.S.C. § 103(a) because:

> The purge plates of Miyajima et al. simply prevent gas from flowing downward along the side of the substrate, which would cause a change in pressure that adversely affects the gas purge process; the purge plates do not prevent the gas from leaking at the periphery of the substrate. The purge gas in Miyajima et al. in fact does flow/leak outward over and beyond the top surface of the purge plates as shown in Figs. 5A and 5B. . . . As Miyajima et al. does not address liquid, Miyajima et al. does not teach designing the purge plates to prevent the leakage of liquid when

exposure occurs near the edge of a substrate.

App. Br. 10–11 (internal quotation marks omitted).

2. Appellants also contend that the Examiner erred in rejecting claims 1–53 under 35 U.S.C. § 103(a) because:

> There would have been no reason to include the purge plates (25a, 25b, 18a, 19a, 1014) of Miyajima et al. in the liquid immersion exposure apparatus of Fukami et al. Fukami et al., which does not use a purge gas between the projection system and the substrate because liquid is in that location, would not suffer from the problem addressed by Miyajima et al. . . .
>
> Moreover, because Fukami et al. has liquid recovery nozzles to recover the supplied liquid and thereby precisely control the liquid immersion area, unlike Miyajima et al., which only has gas supply nozzles but no recovery nozzles (such that the supplied gas escapes laterally, which causes the oxygen concentration problem addressed by Miyajima et al.), it is not seen how the teachings of Miyajima et al. even are applicable to Fukami et al.

App. Br. 12.

3. Appellants also contend that the Examiner erred in rejecting claims 1–53 under 35 U.S.C. § 103(a) because:

> Specifically, because Miyajima et al. does not disclose a size of a space between the periphery of the wafer and the purge plates, the references do not disclose a structure that would prevent leakage of liquid when the immersion area is located over positions that overlap the gap between the purge plates and the wafer or sensor.

App. Br. 15.

ANALYSIS

We have reviewed the Examiner's rejections in light of Appellants' arguments in the Appeal Brief and Reply Brief that the Examiner has erred. We disagree with Appellants' conclusions. Except as noted below, we adopt

as our own (1) the findings and reasons set forth by the Examiner in the action from which this appeal is taken and (2) the reasons set forth by the Examiner in the Examiner's Answer in response to Appellants' Appeal Brief. We concur with the conclusions reached by the Examiner. We highlight the following additional points.

As to Appellants' above contention 1, we disagree. As Appellants recognize, Miyajima's purge plates prevent gas leaking down at the edge of the substrate. *See* App. Br. 10; Miyajima 5:67–6:3, Figs. 5A, 5B. It does not undermine the Examiner's rationale for combining the references that Miyajima's purge plates, when combined with Fukami, would not prevent liquid from flowing outward past the substrate's periphery and past the purge plate's top surface, as Appellants contend, because Fukami has a different mechanism for restraining such lateral flow, i.e., a dividing wall. *See* Fukami, 23 (Applicant provided translation). In addition, Appellants offer no explanation as to how the gas/liquid distinction might impact using Miyajima's purge plates in Fukami and we agree with the Examiner that "[e]ven though the liquid of Fukami et al. has different characteristics from the gas of Miyajima et al., the concept of the purge plates can still be applied to prevent fluid leaking from the periphery of the substrate." Ans. 2–3. Thus, we agree with the Examiner that it would have been obvious to one skilled in the art to combine Miyajima's sensor and top surface table assembly with Fukami's liquid immersion lithography apparatus "to calibrate and measure the illuminance of exposure light and for the purpose of preventing leakage of the liquid at the periphery of the substrate." Final Act. 3–4 (internal citation omitted).

As to Appellants' above contention 2, we disagree. To qualify as analogous art, a reference must be either in the same field of endeavor as Appellants' invention or reasonably pertinent to the problem with which the inventor was concerned. *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992). Despite the gas/liquid distinction between Miyajima and Fukami, both references are analogous art to the claimed invention because, like the claimed invention, both are drawn to photolithography. In addition, Fukami's liquid recovery nozzles do not undermine the Examiner's combination, as Appellants suggest, because they do not teach away from using Miyajima's sensor and top surface table assembly. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) ("The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the . . . application."). In fact, Fukami explicitly recognizes that "it is difficult to recover all the supplied liquid with an inflow nozzle." Fukami, 23 (Applicant provided translation). Thus, combining Miyajima's top surface table assembly would, as the Examiner explains, add sensor functionality (i.e., calibrating/measuring exposure light illuminance), while preventing leaks at the substrate's periphery. *See* Final Act. 3–4 (citing Miyajima, 5:25–28, 5:57–6:3).

As to Appellants' above contention 3, we disagree. Independent claims 1, 21, and 43 require an immersion area "maintained between the projection optical system and a portion of one of the top surface and a surface of the supported substrate or both." As the Examiner explains, Miyajima teaches a gap space small enough to prevent a pressure decrease in the purge space and, in Figure 3, depicts the substrate/purge plate gap and

sensor/purge plate gap as small relative to the other elements. Ans. 4–5 (citing Miyajima 5:67–6:3). We agree with the Examiner that such a gap would be small enough to prevent a significant amount of liquid from leaking into the gap, thus maintaining the immersion area as the disputed claims require. *See id.*

CONCLUSION

For the foregoing reasons, we sustain the Examiner's rejection of independent claims 1, 21, and 43, as well as claims 2–20, 22–42, and 44–53, which Appellants have not argued separately. *See* App. Br. 8–15.

DECISION

We affirm the Examiner's rejections of claims 1–53. No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED